

# FLY ASH UTILIZATION IN AGRICULTURE: RISK ASSESSMENT

RAMI KEREN

**PLANT TOXISITY (B)**

**SOIL WATER QUALITY**

# **Boron - Plant consideration**

Assumptions:

All of the available B content in fly ash at an application rate of 8 tons per acre dissolved in soil solution at water content of field capacity and remain in soil solution at the upper soil layer of 20 cm. B adsorption by soil constituents is taking place.

$$Q_B = T \left\{ 1 + \frac{PR}{F(Q_T - Q_B)} [1 + K_{OH} (OH^-)] \right\}^{-1}$$

$$P = 1 + K_h * 10^{14} * (OH^-)$$

$$F = K_{HB} + K_B (P - 1)$$

Coal	Boron concentration in soil solution, ppm					
	Clay soil			Loess soil		
	Fly ash rate, ton/acre			Fly ash rate, ton/acre		
	8	40	80	8	40	80
Russia	0.08	0.44	0.88	0.11	0.57	1.18
S. Africa	0.006	0.03	0.06	0.008	0.04	0.08
Colombia	0.11	0.58	1.18	0.15	0.76	1.61

# SOIL WATER QUALITY

# THE HYPOTHESIS

When the fly ash content in the upper layer of soil of 20 cm is 8 tons per acre, the concentration of As, Cd, Pb and Hg in soil solution is lower than the Israeli standard of drinking water

# Assumptions:

All of the available As, Cd, Pb and Hg were dissolved from fly ash

Adsorption, precipitation and leaching of elements are not taking place in the upper soil layer of 20 cm

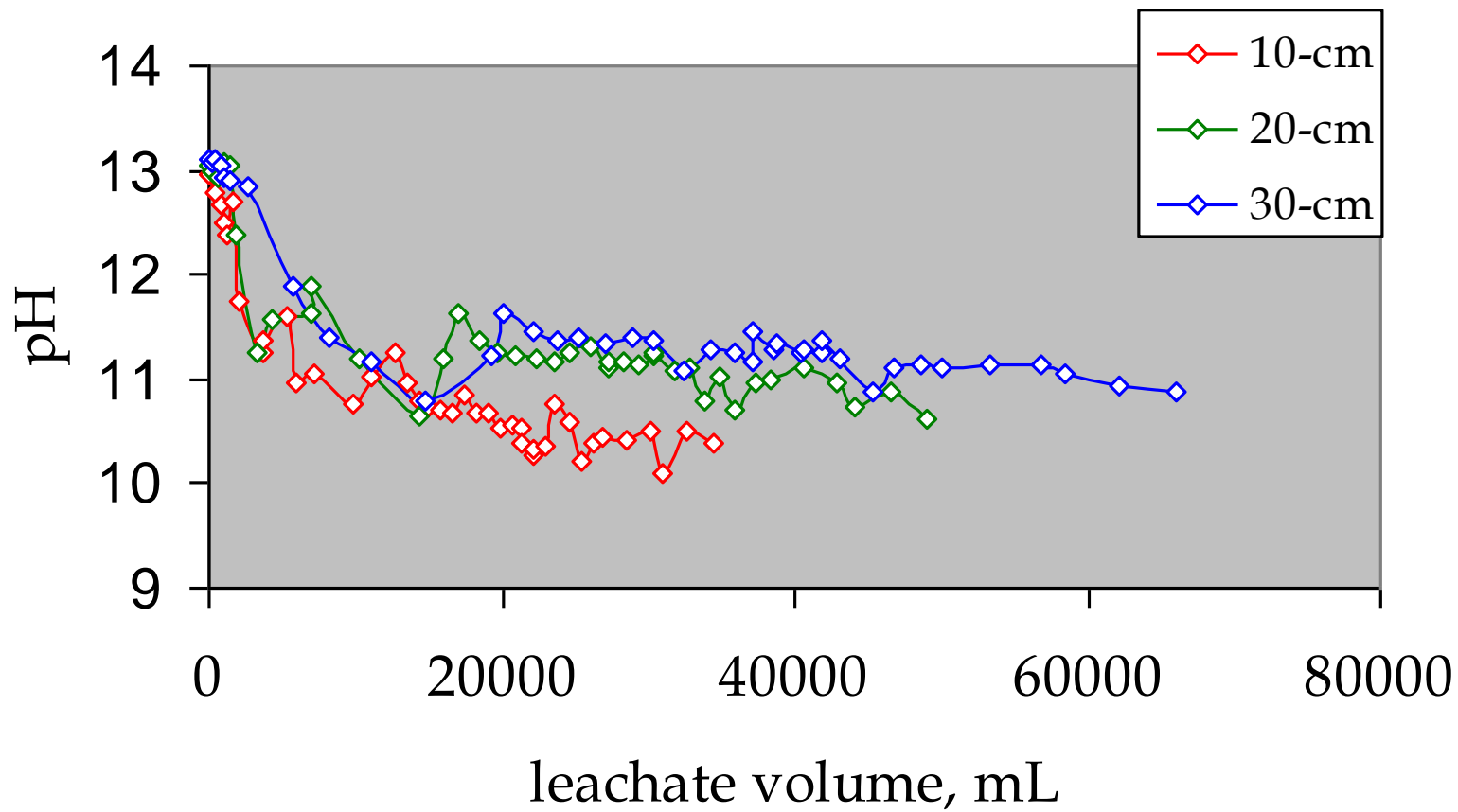


**of Elements in soil solution at field capacity in the upper layer of 20 cm in the presence of FA at application rate of 8 tons per acre**

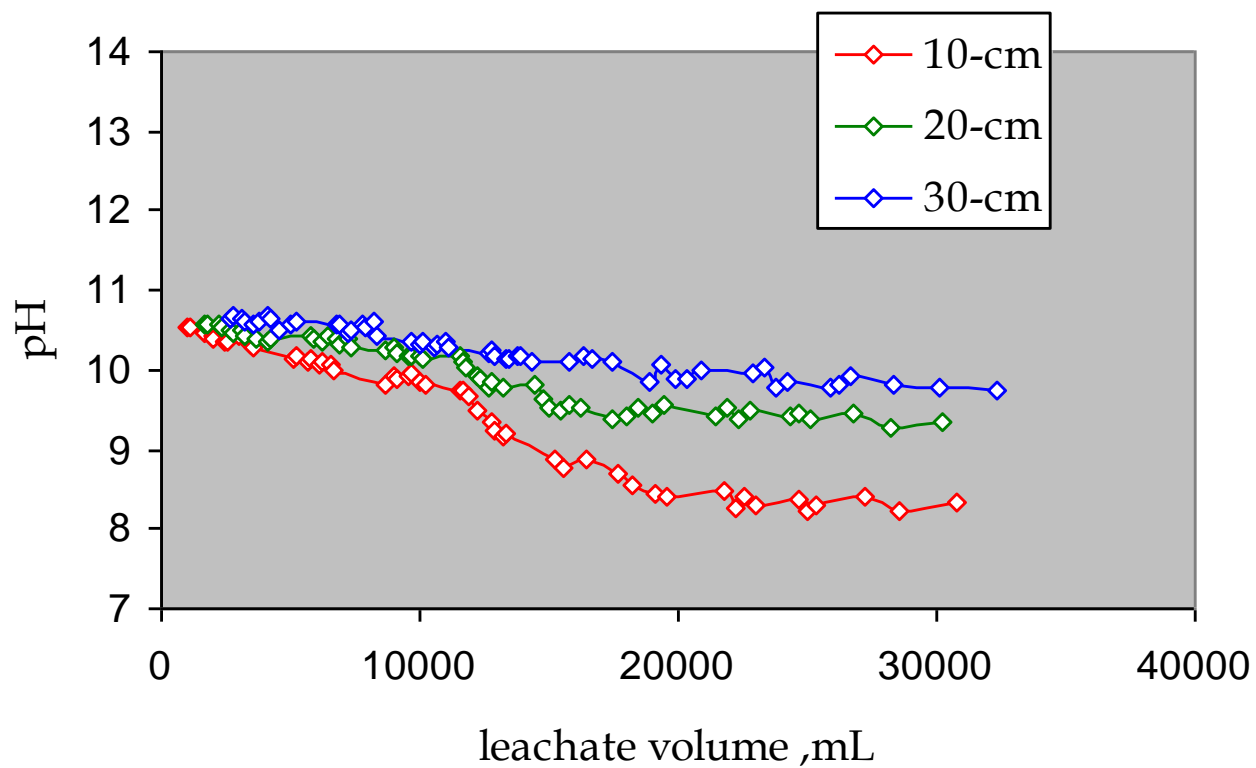
Elements	Concentrations in soil solution at field capacity, microgram/L				
	Clay soil		Loess soil		Israeli standards for drinking water quality
As	3.7	(13)	6.79	(7)	50
Cd	0.27	(18)	0.49	(10)	5
Pb	0.29	(34)	0.52	(19)	10
Hg	0.01	(100)	0.01	(100)	1

Aging of fresh fly ash in soil  
under CO<sub>2</sub> atmosphere decreases  
leaching of B, As, Cd, Pb and  
Hg into soil solution

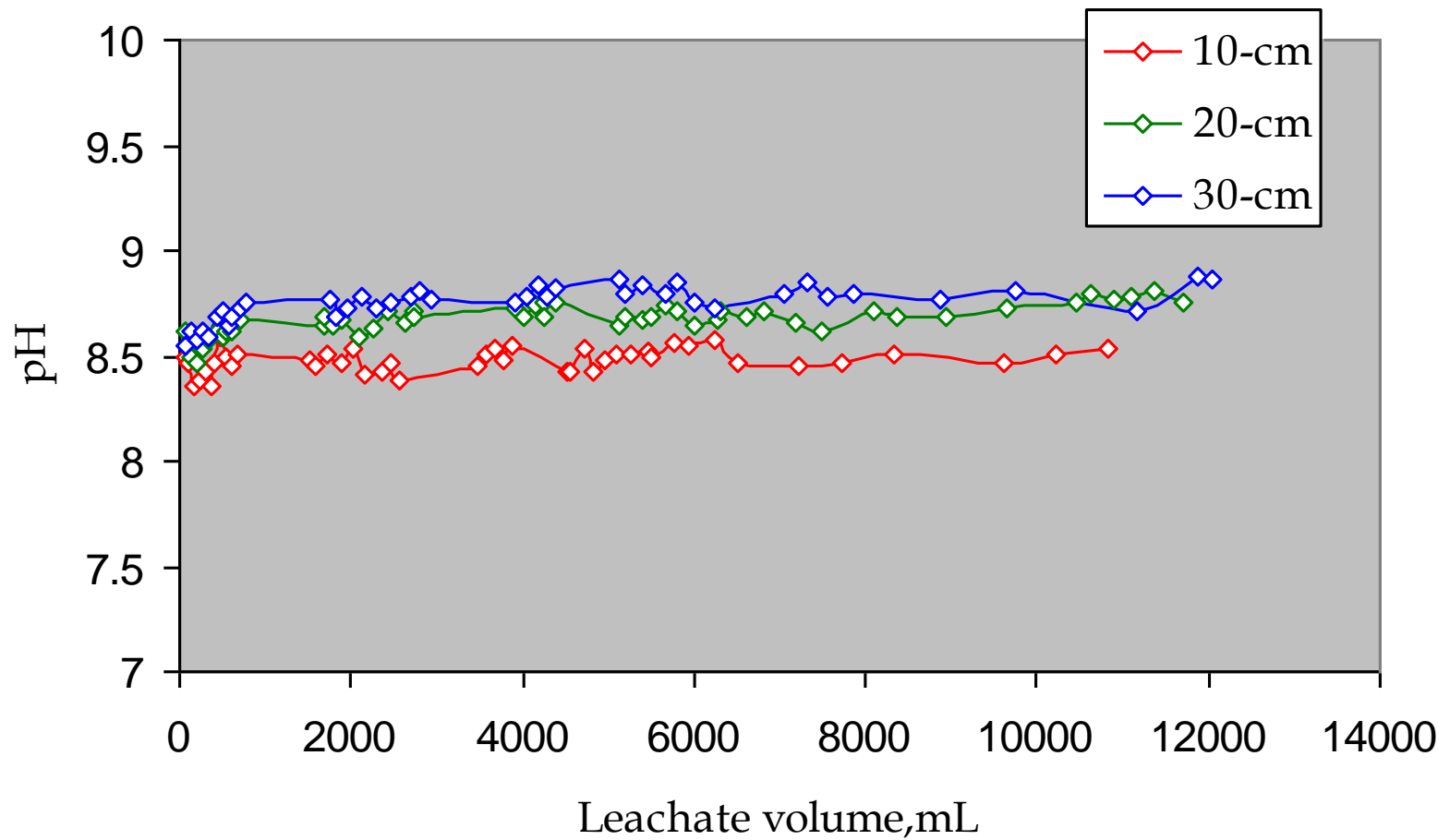
# pH, t=0 months



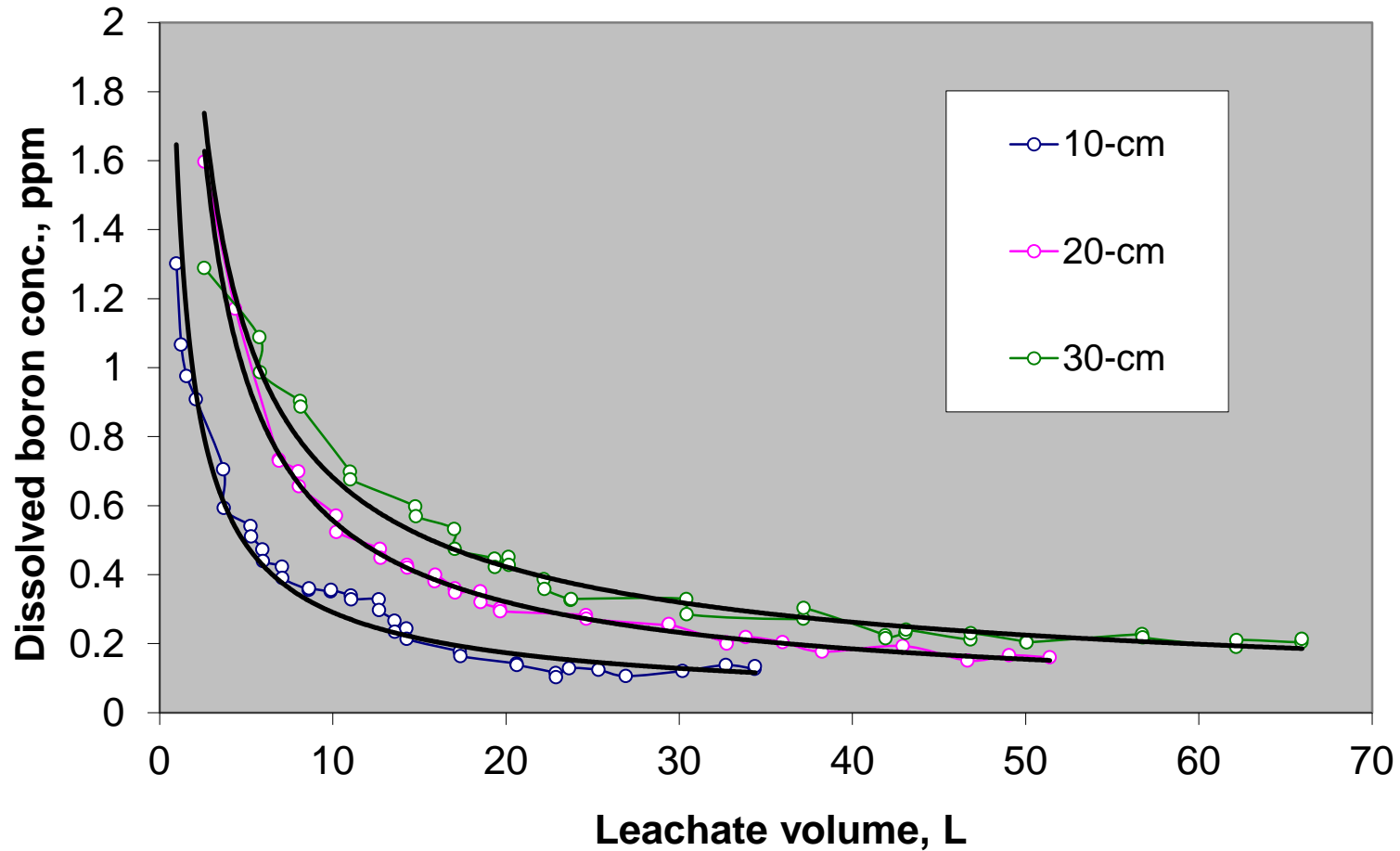
# pH, t=3 months



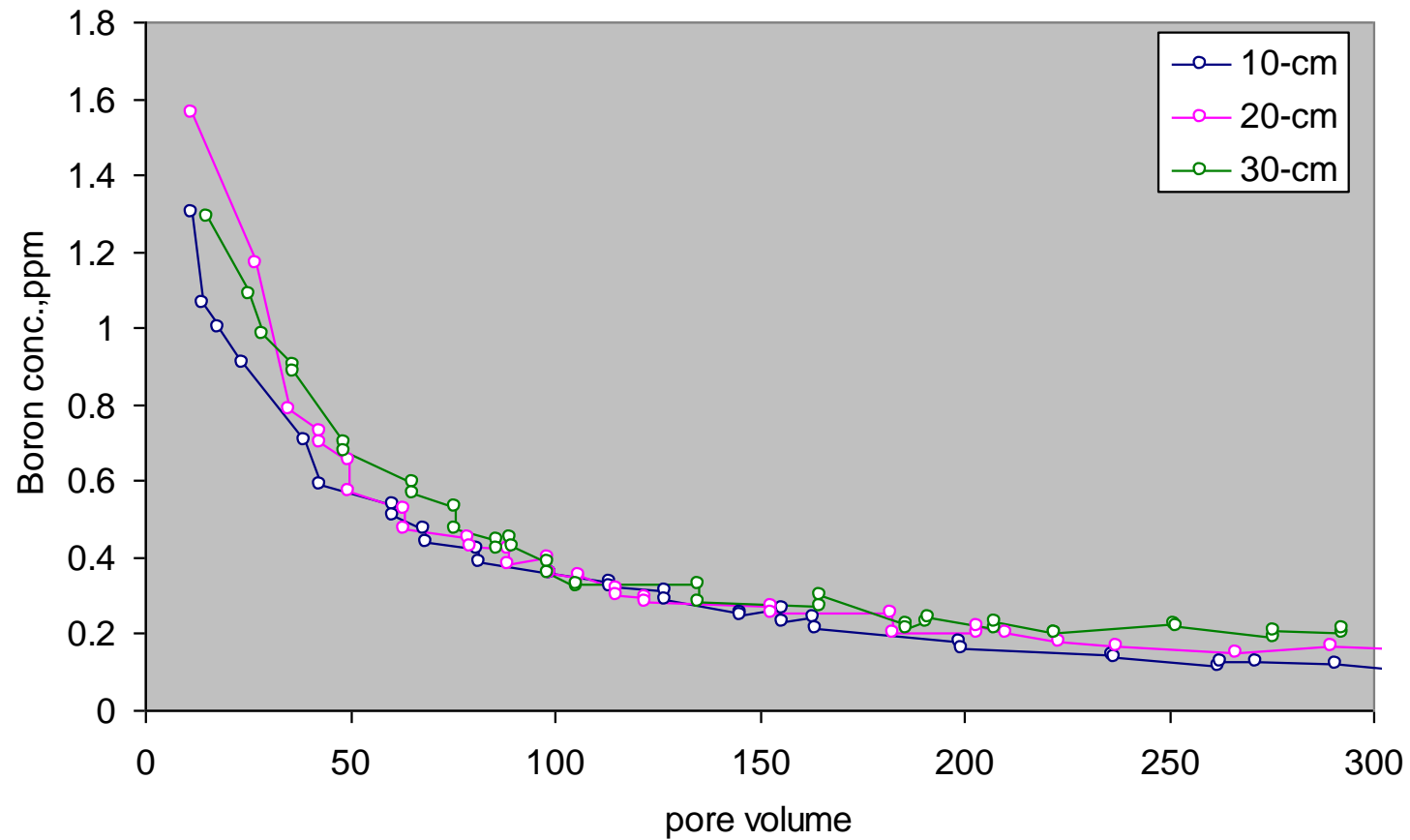
# pH, t =12 months



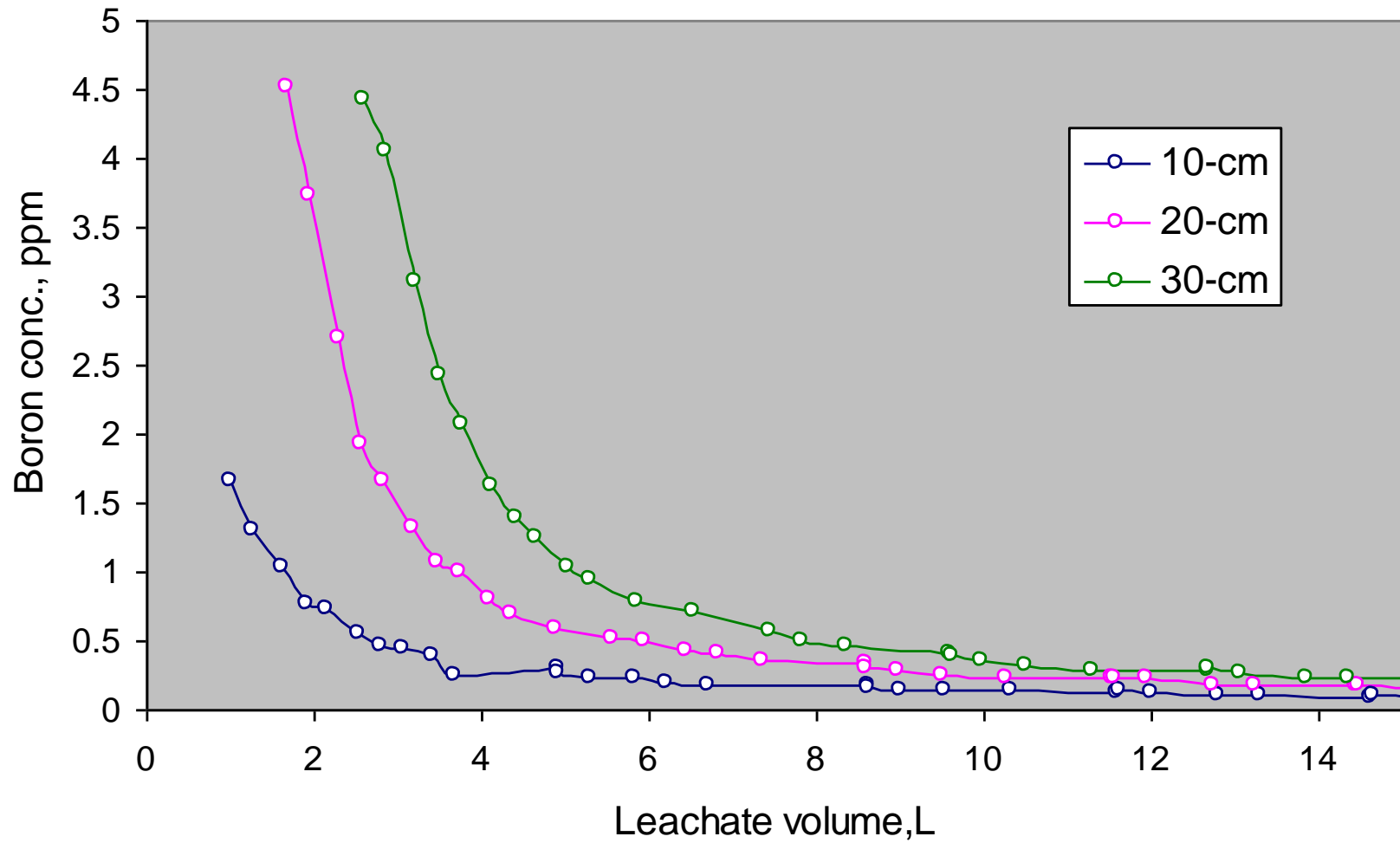
## Boron concentration in leachate, $t_0$



**Boron concentration in leachate,  $t = 0$  month**

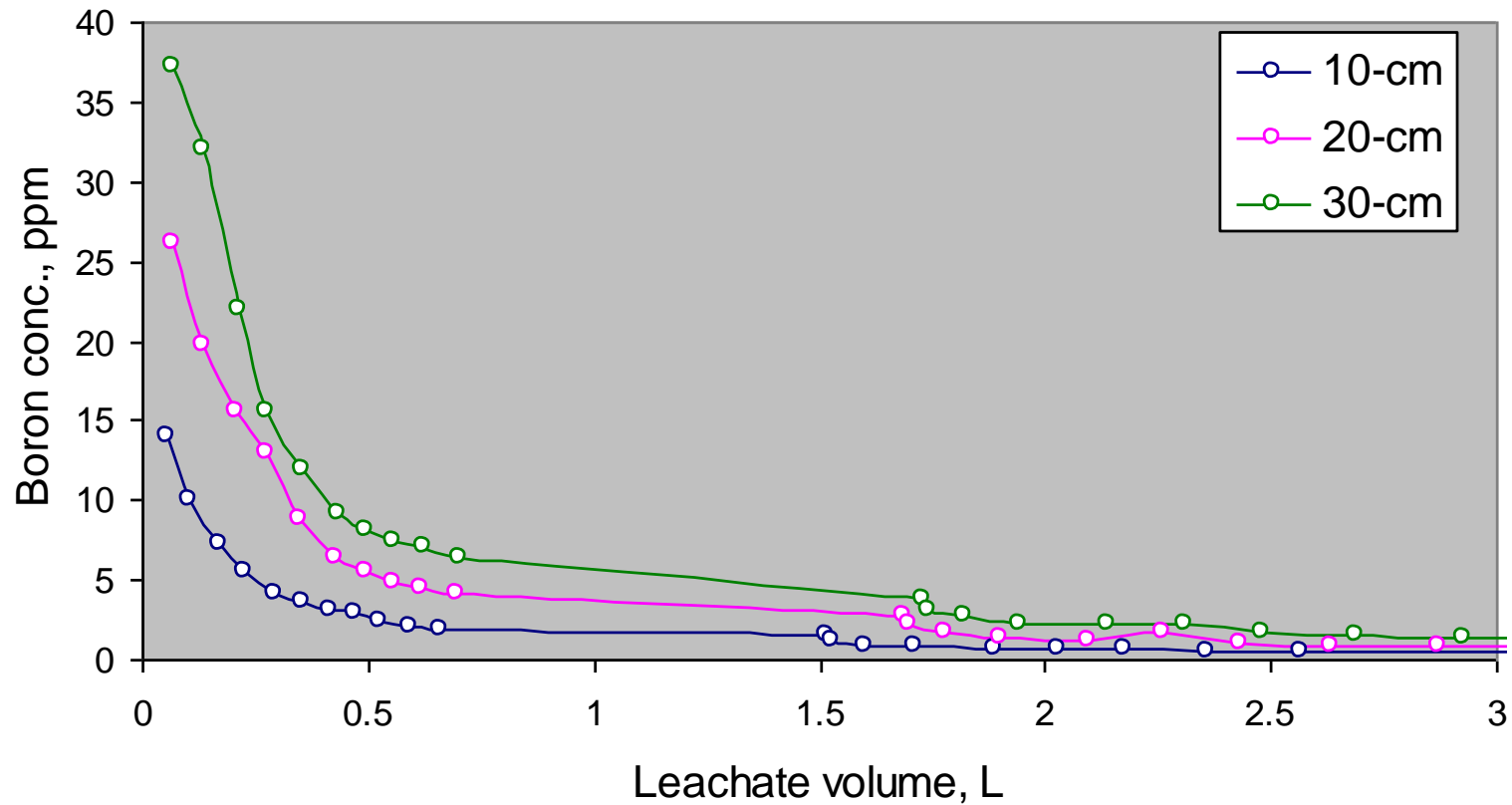


## Boron concentration in leachate, t = 3 months





## Boron concentration in leachate, t = 12 months



**THANK YOU**

